

Mann-Whitney test worked example:

The effectiveness of advertising for two rival products (Brand X and Brand Y) was compared. Market research at a local shopping centre was carried out, with the participants being shown adverts for two rival brands of coffee, which they then rated on the overall likelihood of them buying the product (out of 10, with 10 being "definitely going to buy the product"). Half of the participants gave ratings for one of the products, the other half gave ratings for the other product.

Brand X		Brand Y	
Participant	Rating	Participant	Rating
1	3	1	9
2	4	2	7
3	2	3	5
4	6	4	10
5	2	5	6
6	5	6	8

Which test do we use?

We have two conditions, with each participant taking part in only one of the conditions. The data are ratings (ordinal data), and hence a nonparametric test is appropriate - the Mann-Whitney U test (the non-parametric counterpart of an independent measures t-test).

STEP ONE:

Rank all scores together, ignoring which group they belong to.

Brand X			Brand Y		
Participant	Rating	Rank	Participant	Rating	Rank
1	3	3	1	9	11
2	4	4	2	7	9
3	2	1.5	3	5	5.5
4	6	7.5	4	10	12
5	2	1.5	5	6	7.5
6	5	5.5	6	8	10

STEP TWO:

Add up the ranks for Brand X, to get T1

Therefore, $T1 = 3 + 4 + 1.5 + 7.5 + 1.5 + 5.5 = 23$

STEP THREE:

Add up the ranks for Brand Y, to get T2

Therefore, $T2 = 11 + 9 + 5.5 + 12 + 7.5 + 10 = 55$

STEP FOUR:

Select the larger rank. In this case it's T2

STEP FIVE:

Calculate n1, n2 and nx

These are the number of participants in each group, and the number of people in the group that gave the larger rank total.

Therefore n1 = 6

n2 = 6

nx = 6

STEP SIX:

Find U

(Note: Tx is the larger rank total)

$$U = n1 \times n2 + nx \times \frac{(nx+1)}{2} - Tx$$

$$U = 6 \times 6 + 6 \times \frac{(6+1)}{2} - 55$$

$$U = 6 \times 6 + 6 \times \frac{(7)}{2} - 55$$

$$U = 36 + 21 - 55$$

$$U = 57 - 55$$

$$U = 2$$

For $n_1 = 6$ and $n_2=6$, the critical value of U is 5 for a two-tailed test at the 0.05 significance level.

For $n_1 = 6$ and $n_2=6$, the critical value of U is 2 for a two-tailed test at the 0.01 significance level.

STEP EIGHT:

To be significant, our obtained U has to be equal to or LESS than this critical value.

Our obtained U = 2

The critical value for a two tailed test at .05 significance level = 5

The critical value for a two tailed test at .01 significance level = 2

So, our obtained U is less than the critical value of U for a 0.05 significance level. It is also equal to the critical value of U for a 0.01 significance level.

But what does this mean?

We can say that there is a highly significant difference ($p < .01$) between the ratings given to each brand in terms of the likelihood of buying the product.